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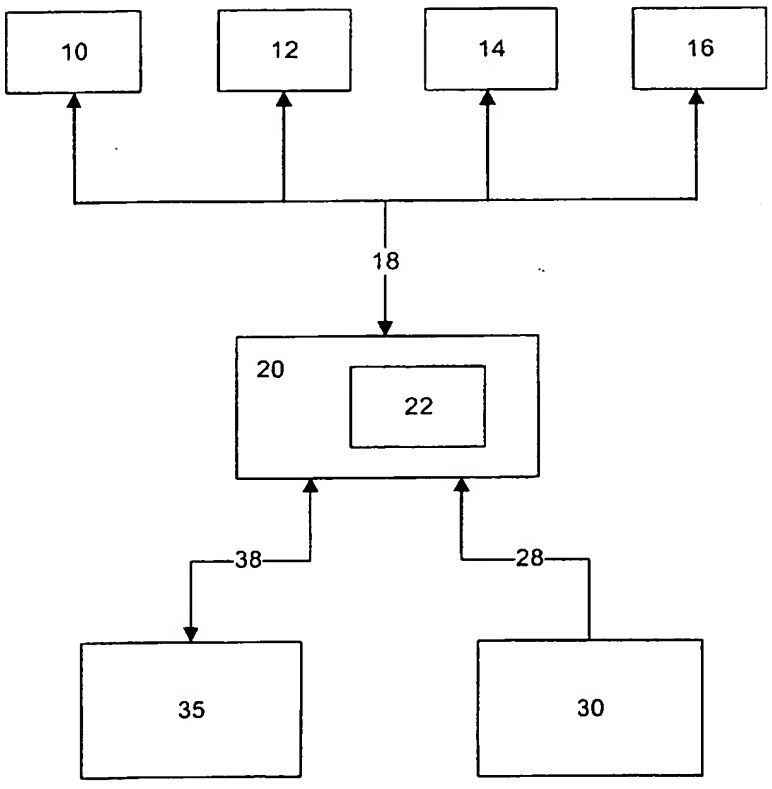
(54) Title: METHOD AND SYSTEM FOR MATCHING SHOES AND INSOLES TO FEET




(57) Abstract: The present invention relates to a method of facilitating acquisition of perfectly fitting footwear including anatomically designed insoles, for a user's foot by means of a computer system. The system comprises a data base (20, 22) which is accessible from at least one user terminal (10, 12, 14, 16) and from at least one retailer terminal (30). Furthermore, the method is characterized by the steps of: determining (steps 102, 103), a set of dimensions of the user's foot by means of a measuring device; delivering (step 107) the foot dimensions to the database (20, 22) comprising data on a plurality of footwear for searching for footwear which matches the foot dimensions; receiving (step 108) data on the footwear matching the determined foot dimensions; and visualizing (step 109), by means of a visualisation means (35), data on the user terminal (10, 12, 14, 16) concerning the matching footwear, including anatomically shaped insoles or other inserts which, together with the rest of the footwear, improves the fit additionally. In this way, more people will have access to specially fitted shoes at reasonable price, which has appreciable effects on the general level of health.

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# Method and system for matching shoes and insoles to feet

## The technical field of the invention

The present invention relates in general to the technical area of fitting footwear and insoles to feet and in particular to feet having unusual dimensions.

## Background of the invention

For quite some time it has been known that stress on various parts of the body can give rise to both repetitive strain injuries and less permanent damage, which may be still just as painful. Examples of these types of injuries are foot and shinbone related symptoms and injuries and stiffness in the back and neck. People who use shoes ill-adapted to their unique physiology often develop complications. These complications can be, for example, neck and joint tension, back pain or cramps, and if these people continue to use ill-adapted shoes, these strains can progress to chronic aches and permanent injury.

As already mentioned, however, it is not only repetitive strain injuries and excessive or oblique loading injuries which can be painful for the wearer of ill-fitting shoes. Corns, ingrown toenails becoming gradually blue in colour, chafing and pressure points causing bruises and sore toes can be quite detrimental.

Everyone does not find purchasing shoes to be a simple process. Especially people with feet which deviate far from the norm have great difficulty in finding a shoe that fits, whether it is a walking shoe, a ski boot, a casual shoe or some special shoe, for example, a running shoe. It is also time consuming, of course, to find shoes having satisfactory fit and which have an attractive appearance, to make the buyer completely satisfied. Many different types of shoes, models and sizes must be tried on and therefore a large number of retail outlets are often concentrated in certain major

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urban areas. In small towns, however, a satisfactory selection of shoes is often not possible, and people living in these areas must make do with less than satisfactory shoes as regards repetitive strain injuries and which are not particularly suitable. Even with a large number of retail outlets, it can be impossible for certain people to find shoes that fit. These people have perhaps quite unusual foot measurements, an altered foot anatomy after an operation or other congenital deviations from normal foot measurements. Previously these people have had to buy orthopedically designed special shoes which can be both expensive and provide a very limited selection of suitable shoes.

Previously known technology in this field, e.g. as described in WO 91/17708, includes a system for measuring foot dimensions, said dimensions being converted into a control program for manufacture of shoes in order to tailor-make shoes for the needs and desires of the wearer. Unfortunately, such a system is limited to certain manufactures of shoes having access to the extensive measuring and control equipment required.

Another known technology, described e.g. in US 5 515 268, includes a system and a method of finding products of the correct size. The description of the patent assumes that it is always possible for a potential buyer to find a product, such as a shoe which fits, especially as regards anatomical fit but also as regards more subjective criteria. This is, however, not the case, especially if the buyer has unusually deviant foot dimensions and might actually need orthopedically designed special shoes.

## Summary of the invention

A purpose of the present invention is to overcome said difficulties and problems in connection with using the previously known technology within the technical field of the invention, e.g. published patent specification WO 91/17708 and US 5 515 268.

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Previously mentioned difficulties and problems are overcome by a process for facilitating the acquisition of perfectly fitting footwear including insoles anatomically designed for the foot of the user, by means of a computer system, said system comprising a data base, which is accessible from at least one user terminal and from at least one retailer terminal, said method being characterized by the steps of:

determining a set of measures of the user's foot by means of a measuring device;

delivering the foot dimensions to the data base comprising data on a plurality of footwear, for searching for footwear matching the foot dimensions;

receiving data on the footwear matching the determined foot dimensions; and

visualizing by means of a visualisation means data on the user terminal concerning the matching footwear, including anatomically designed insoles or other inserts, which together with the other footwear improves the fit additionally.

An advantage of the invention is that injuries and chronic symptoms in joints, the neck and back, problems dependent on unbalance or excessive strain due to unsuitable shoes, can be reduced substantially and in many cases be completely or partially remedied. Furthermore, the system according to the invention will make it both simpler and less time consuming for a consumer to find a suitable shoe for the individual. This particularly applies to people with feet, the appearance and dimensions of which deviate unusually from the norm. This shoe will be positive for the body when used, will agree with the desires of the consumer and have a very good fit. Last but not least, the shoe will be equivalent to an orthopedically designed shoe but at a substantially lower price, which will be advantageous not only to the buyer but possibly also to society if orthopedic shoes are subsidized for truly needy persons.

In addition to the above mentioned advantages for the process and system according to the invention, it provides people in less populated regions with the same possibility of finding shoes which is available to people living in urban areas with many shoe stores. The same also applies, of course, to people who for various reasons, e.g.

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movement impairment, shiftwork or care of children, have difficulty in making time for searching for shoes at various retail outlets. This invention will provide these people as well with access to the same range as other people.

An additional advantage of the system is that certain intermediates traditionally placed between the manufacturer, wholesalers and the consumers can be eliminated, stocks can be kept at low rent locations and sales personnel can be kept to a minimum with the same level of service. These factors raising productivity and efficiency should make it possible to reduce prices for the final consumer to the advantage of a very large group of people.

In the system according to the invention a last is reconstructed from a shoe available on the market, and the last dimensions are forwarded and stored by the data base for subsequent visualisation and matching processes. Reconstruction of the last on the basis of shoes available on the market is advantageous since the system is made independent of shoe manufacturers and their possible demands for exclusive rights to use the system to supply their own last dimensions. The reconstruction of last dimensions could also be made with the aid of last dimensions supplied by various shoe manufacturers, even if this is less probable in view of the enormous resources which are put into developing new shoes and in view of the stiff competition between different shoe manufacturers.

With the aid of the present invention, people with minor ailments due to poorly fitting shoes, will have access to an anatomically fitted shoes. For a reasonable cost these people can buy shoes with specially adapted insoles, largely corresponding to orthopedically designed special shoes. In view of the reduction in sick days and substantially reduced sick care costs, the invention should be of substantial benefit to society.

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Short description of the drawings

Fig. 1 shows a block diagram of the parts included in the system for matching according to the invention.

Fig. 2a shows a detailed flow diagram of the process for facilitating acquisition of a suitable shoe with emphasis placed on the initial input and the matching.

Fig. 2b is a partially overlapping continuation of the flow diagram from Fig. 2a, with the emphasis on the possibility of counselling, the production of specially adapted insoles and a new selection.

Fig. 3 provides en overview of possible parameters which can be included in the matching of foot dimensions and possible shoes, where the selection of parameters has been ordered hierarchically.

Detailed description of the invention

With reference to the block diagram of Fig. 1, the major components of a first embodiment are shown. The system includes terminals 10, 12, 14, 16, which are used by the user, said terminals 10, 12, 14, 16 being in communication with a comparative computer 20 through two-way communication means 18. It is conceivable that the terminals 10, 12, 14, 16 are personal computers, for example, or other electronic communication means in the homes of the users or at their places of work, and that the comparative computer 20 is a so-called server with a capacity to handle a great number of users at the same time. The two-way communication means 18 can be a globally linked network, such as the Internet, for example, or a comparatively small and local network, such as a Local Area Network (LAN) or a wireless LAN.

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Fig. 1 also shows a feeding computer 30 from which the dimensions of various shoes can be fed via a communication means 28 into the memory 22 of the comparative computer 20, to be able to be compared in the comparative computer 20 with the desires and foot dimensions of the user. From the comparative computer the results of one or more comparisons can be sent to the terminal 10, 12, 14, 16 of the user to make a selection amongst those shoes and associated insoles which fulfil the criteria set by the user during the matching. All of the communication means 18. 28, 38 included in the present invention can be of varying types, e.g. electric cables, radio links, infrared or microwave technologies for transmission of information, and varying interfaces can also be used, including different conceivable wireless interfaces, such as Bluetooth or Wireless LAN. Fig. 1 shows also an aid 35 for visualisation, said aid 35 comprising a powerful processing tool, preferably a computer, to construct a visual model of both the foot from measured and stored foot dimensions, and the inner spaces of the shoe based on measured and stored inner dimensions for various shoes.

An important aspect of the present invention is that the visualisation aid 35 does not need to simulate a graphic model of a foot and a shoe. A very simple matrix containing comparative data on the entered foot dimensions and shoe dimensions will fill the same function, even if user friendliness is possibly not as great. Advantages are that a more simple visualisation aid 35 can be developed rapidly and inexpensively, and also have very high reliability. Skilled professional orthopaedists used to using a simple comparative matrix will manage quite well without the extra user friendliness which an advanced visualisation aid 35 provides. Therefore, a matrix comparison can be a good supplement to a graphic visualisation aid 35.

When comparing these different sets of measurements, agreement between the dimensions of the foot and the inner dimensions of the shoe can be compared virtually, i.e. the fit of the shoe can be evaluated to aid the user in deciding whether to buy the shoe in question. Preferably the evaluation is visualized with the aid of vari-

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ous coloured or patterned fields, applied to the virtual foot, each implying a certain pressure on the foot. Alternatively, as was described above, a more simple matrix presentation can provide the same information. If the pressure on the foot is higher than what is considered suitable, the user will be informed thereof by the system and can either accept this pressure and continue with the sequence or select a new shoe to visualize. A more detailed example of how these pressure fields are determined will be disclosed in a subsequent section of this patent specification. If there is a field with a lower pressure than what is judged to be a good fit, also called an air surface between the shoe and the foot, various types of insoles can be shaped to achieve a better fit. This can be, for example, a shaped insole of variable thickness or a heel support or even different thicknesses of the user's stockings. The insole can be a simple anatomic arch support, an entire sole which follows the arch or even an insole corresponding to an orthopedic special insole. When judging the suitability of a certain pressure, consideration is also taken to the pliability of the shoe material, which varies with the elasticity of the shoe material and also with the intended primary use of the shoe. The point of attachment of the tongue to the shoe is also a factor which the system takes into account.

The above comparison also provides the possibility of storing the history of previous fittings and comparisons, which are stored in the memory of the system. History in this context means the possibility for the user to go back and study and compare with his previous purchases, which were made with the aid of the system. The user can thus compare the parameters on which the previous purchases were based with the present parameters. The history aids the user in making use of his own previous purchases, facilitating his present and future selection of a correct shoe and a suitable insole.

Figs. 2a and 2b show a flowchart of the function of a first embodiment of the invention. The flowchart shown in Fig. 2a contains two different starting positions. At top left there is the first start position, which is intended to be used by prospective shoe

purchasers. These prospective purchasers will be called below "users". The user sequence begins with a so-called log-in (step 101), with the user providing a personal user name and a password. These user names and passwords are checked (step 102) with the existing contents of the memory in the system and if it is complete, the sequence will proceed. The contents of the memory in the system is divided into different categories of data. On the one hand, there is an obligatory category of data which must be or have been provided, and in addition to these, there are supplementary optional user data. Furthermore, there can be optional data which can be disclosed only as needed or for other reasons. The degree of foot measurement precision can be up to the user, but the more precise the input data are, the better will be the final match. Some of the data are measures of the user's feet. How these are measured is described in more detail in a later section.

If the obligatory data have not been entered in a completely satisfactory manner, i.e. if at least one obligatory user data is lacking in the system, the user will be asked to enter (step 103) the missing data which is then stored in the system memory. After this entry, the contents of the memory in the system is ready for matching from the perspective of the user. The user also has the possibility of changing existing data or supplementing it with new data whenever so desired. If the user intentionally or unintentionally leaves out certain non-obligatory data, and this can occur for various reasons, such as lack of time or uncertainty, the system will provide a greater selection since a greater number of shoes will agree with the user's stated wishes. In certain situations, it can be advantageous for the user, for example, if he or she is interested in getting an overview of what is available rather than searching for a certain shoe of type of shoe.

At the top right in the same flowchart, i.e. Fig. 2a, there is a second start position which is intended for personnel who enter properties and measurements of shoes to subsequently be matched with various users who are connected to the system. The personnel sequence begins, as does the users' sequence, with a log-in (step 104) into

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the system, with the personnel providing in a similar manner a user name and a password. If the personnel is accepted by the system, a unique designation is disclosed for the shoe, the parameters of which, i.e. as regards appearance, features and inner dimensions, is fed into the system. Of course, these parameters can be measured in various manners as will be specified below, but the most simple manner used is to enter the data measured and disclosed by the shoe manufacturer. Photographs of the shoe, possibly from various angles, can be entered into the system. For this it is necessary that the format of the photographs be computer-readable. Possibly a specially designed program can be used, making it possible to view the shoe from various angles, as selected by the user himself from his own terminal. A check is made (step 105) in the system as to whether all the parameters of the shoe are already known by the system and if this is the case, the measuring personnel is informed thereof. Otherwise, i.e. if the parameters are unknown for the system, the personnel is prompted to enter (step 106) all the parameters which are necessary for the system, via his entry terminal. These measured and evaluated parameters are then transferred to the system memory, where they are stored for later use in matching.

The two start sequences for the user and for the measuring personnel come together after these checks, entries and information transfers in a matching procedure (step 107), where the user requests and dimensions are matched to all available shoes in the system memory. A list is formulated, preferably in ascending order with the best matching shoe at the top. It is completely conceivable to rate the available shoes after how well they match the dimensions and desires of the user. Furthermore, this rating can be weighted so that "fit" is multiplied by a higher factor than "intended area of use", but the intended area of use can be weighted by a higher factor than "colour". If there is no exactly matching shoe available, a list is still drawn up with the highest matching rating shown at the top, even if this shoe does not agree completely with all of the selection criteria when the matching was done. Alternatively, shows are provided in a similar list but with suggested insoles, with all of the sug-

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gested shoes having sufficiently good fit to satisfy the wishes of the buyer. Here it is suitable, from Fig. 2a to view the flowchart shown in Fig. 2b. The list is shown (step 108) to the user on his terminal and from there, the user selects (step 109) himself one of the shoes shown to have visualized. The visualisation is effected with the visualisation aid 35, which can be a so-called CAD (Computer Aided Design) computer, containing a specially written program for design and construction of three-dimensional bodies, based on a number of points which are joined with the aid of virtually created surfaces. Alternatively, as was mentioned above, a matrix representation of sectional surfaces can be used for the same purpose. The set of parameters which are entered will form the basis of the model of, on the one hand, the foot of the user and, on the other hand, the shoe in question which is created. The sectional surfaces between the model of the foot and the model of the shoe are analyzed to investigate whether the fit of the shoe is suitable for the user's foot and for other purposes. The pressure of the shoe against the foot is also investigated to decide whether the shoe is suitable for the user. This aid 35 for visualisation is in two-way communication with the comparative computer 20, via an additional communication means 38.

One example of how the analysis of the sectional surfaces between the model of the foot and the model of the shoe can proceed is as follows: the difference between the inner volume of the shoe, which is a simulated model of the interior surface of the shoe, and the foot volume, which is a simulated model of the outer dimensions of the foot, is computed. If the difference is negative, portions of the volumes overlap each other. A so-called pressure surface must be taken into consideration when matching. If the difference, however, is positive, the two volumes are not coinciding and there is a space between the foot and the shoe. A so-called air surface must be considered when matching. Such consideration can be to suggest a matching sole, i.e. which improves the fit, or an existing or specially manufactured insole. According to the invention, as was already described, the user is given the possibility of buying the shoe and at the same time buying an associated sole, a removable foot

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bed, or an anatomic insole matching the shoe, which will correspond to an orthopedically adapted special shoe.

During the visualisation, where the user's foot is built up artificially with the aid of simulation or a matching matrix starting from entered foot dimensions, the fit and properties of the shoe are analyzed (step 110) and a statement is presented on the user's terminal. If the user is satisfied with, i.a. the appearance, properties, price and fit of the shoe, the sequence proceeds and makes order possible. In the following, such an order will be described in more detail. If the user is, however, not completely satisfied with the appearance, properties and fit of the shoe, he or she will be asked whether personal advice (step 111) regarding suitable shoes for the user could be of interest. If the answer is yes, and personal advice is desired, an adviser is informed of this and makes contact (step 113) with the user, whereupon address and contact information previously entered by the user is used. During the advising, there is the possibility for the advising person to enter supplementary information concerning the user to facilitate processing and advising of the same user, should the user make contact at a later occasion, even if the contact should be with another advising person. This adviser can make the match between feet and shoes and insoles on his own or guide the matching sequence, while the buyer of the product passively follows the process. This can be due to the buyer's uncertainty in using the computerized matching system or for other reasons, for example, if the buyer is temporarily without access to a user terminal but is still in need of special fit shoes and insoles. If advice is of no interest to the user, he is prompted (step 112) to make a new choice from the list of shoes and is transferred in that case back to the viewing of the list (step 108). If there is no user interest in a new selection from the list, the sequence is terminated and the user must log in again the next time he or she wishes to make a virtual trying on of shoes with the aid of the system according to the invention.

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Previously it has been described how the virtual fit of the shoe is analyzed (step 110) and a statement is produced and presented to the user. If the user is satisfied with the result, the system provides a possibility of buying the shoe. The user is asked (step 114) if he or she wishes to buy the shoe, possibly with accessories and/or recommended insoles, and if the answer is positive, i.e. that the user wants to buy the shoe, the purchase is confirmed (step 116). If the insole is to be specially fitted, the required instructions, including the dimensions of the insole, are sent (step 117) to a computer-controlled cutter or other manufacturing equipment. A number of automated production methods for insoles are conceivable, such as various types of computerized free-form fabrication. After the manufacturing step, the shoes are sent together with the insoles and possible additional accessories together with a bill to the user. At the end of the matching sequence, the user, who is now also a purchaser of shoes after virtual testing thereof, receives a question from the system whether he wishes to try on (step 118) additional shoes with insoles. If there is interest in this, the user is transferred back to the check of entered user parameters (step 102) in order to be able to select, for example, a new field of use or to give a new desired colour or form of conceivable and interesting shoe selections. If there is no such interest on the part of the user to virtually try on additional shoes with insoles, he is transferred to the end of the sequence and must, as before, log into the system once again for the next virtual fitting.

As was already indicated, there are a number of parameters included in the system which help the user in a well defined manner to find a shoe which satisfies his or her needs. These parameters must be entered in by both the user and measuring personnel, but since the parameters have been saved in the system, all of the user's parameters do not need to be re-entered into the system at more than a first occasion. With reference to Fig. 3, a hierarchical ordering of a number of conceivable entry parameters is suggested. These parameters are intended to be used by both the user and by measuring personnel who are registering shoes in the system.

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At the top of Fig. 3, a general field "Shoe parameters" is shown under which the various parameter types are to be found under the headings "Appearance", "Properties" and "Dimensions". The heading "Appearance" includes such selectable parameters as "Colour", which can also comprise specific colours and colour combinations as well as general impression, e.g. "Light", "Dark", "Colour" and/or "Patterned" and "Age category", e.g. "Child", "Youth", "Adult" and/or "Senior".

Furthermore, other conceivable user requests have been collected under the heading "Properties", which can be parameters such as "Sex", i.e. whether the user is a woman or a man, and "Price" so that the user can state what is the highest price he or she is prepared to pay for the shoes in question, or specifying a particular price range within which the shoes might be of interest to the user. Another important selectable parameter is the type of activity for which the shoe is primarily intended, i.e. what field of use the manufacturer has primarily designed a shoe for. Many shoes can, of course, be used in a number of different activities, but it can still be of great assistance to the user to select "Area of use" for the shoe. A few examples of such are "Street", "Hiking", "Running", "Special sport", e.g. down hill skiing, inline skating, ishockey, bowling, etc., "Aerobics", "Casual" and "Party/Dancing".

Under a third heading "Dimensions", there are various parameters associated with shoe fit. With the aid of the system, a large number of foot dimensions can be entered and stored for later use as well to provide the user with a shoe which fits essentially like a tailor-made shoe. A large number of foot dimensions could be used. The more dimensions that are used, the greater will be the probability that a perfect fit will be provided. Otherwise, there are anatomically adapted and fitted insoles. A number of possible dimensions for use in the system are "Overall length", "Greatest width", "Toe height at big toe", Ball dimension", "Heel width", "Instep height", "Ankle heights" and "Pull on dimensions". Since there may be minor differences between the right and left foot of the same individual, or major differences in exceptional cases, the feet are measured individually and stored in the system in-

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dividually to provide satisfactory fitting. Assuming that the left foot is a mirror image of the right foot is probably not sufficient for satisfactory fitting.

Selection possibilities in the system are, of course, not limited to that described above. Rather, a number of conceivable selections can be introduced as additional parameters in the system to benefit the user. Such parameters can be how the ball of the foot comes down when walking or when running, i.e. whether the user has a certain type of running style belonging to one of the categories "pronater" or "supinater". The weight and level of ambition of the user can also be of interest in deciding what shock absorption is required and whether the user has an exaggerated inward or outward foot orientation.

As was previously mentioned, when measuring the user's feet, there are many different possible methods, one method and possibly the most simple, is to use a common measuring tape with the aid of which all the measures can be taken. These measuring tapes can, in accordance with one embodiment, be generated as a paper printout from any of the user terminals 10, 12, 14, 16. A contour of the user foot sole dimensions can be printed out from the user terminals 10, 12, 14, 16 on one or more complementary sheets of paper. If needed, other aids available in most homes can be used, such as a ruler, paper and pen. All of the required instructions are given for executing a correct measurement in connection with user entry of dimensions into the system from the user's terminal. For example, a number of measurements of various foot dimensions can be made with the aid of paper strips, fixed to a cut-out contour of the user's sole. These strips are folded up and over the foot and thus can carefully measure the various circumferences of a user's foot, which can be useful in making it possible for the system to make a satisfactory fit.

In order to get an idea of how the user places loads on his soles, a so-called mirror-box can be of great assistance. Such a mirror-box is a suitable implement which can be used for rapid, precise and efficient measurement of foot parameters for entry

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into the system according to the invention. Handling such apparatus requires, however, professional knowledge/personnel, which is usually available where there are mirror-boxes. In particular cases, a cast of the foot can be made in plaster, for example, and a very precise measurement of the foot dimensions can be made when the plaster has hardened. The user no longer needs to be there for the measurement after the cast has hardened. Reading of the foot dimensions with the aid of computer technology, so-called scanning of the foot and its outer dimensions is also a possibility. The scanning device has in this case been adapted to measuring foot dimensions and storing these in a simple and rational form, which can be read by the computer and used in the system according to the present invention.

When manufacturing insoles, account is taken of taken of the foot anatomy and the shape of the shoe. When needed, individually adapted air gaps can be cut out or be included during manufacture. These air gaps are spaces between the sole of the foot and the insole. Such individually adapted air gaps are particularly suited to users with slowly healing foot sores due to certain types of diabetes or other chronic foot ailments such as corns and heel spurs. Individually adapted air gaps, which have been cut out or built into the insoles, take the load off any sore surfaces and thus permit healing of the sores and treatment of other foot ailments, even if the user must wear shoes.

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## Claims

1. Method of facilitating the acquisition of perfectly fitting footwear including anatomically designed insoles for a user's foot, by means of a computer system, said system comprising a data base (20, 22), which is accessible from at least one user terminal (10, 12, 14, 16) and from at least one retailer terminal (30), said method being **characterized** by the steps of:
   - determining (steps 102, 103) a set of measures of the user's foot by means of a measuring device;
   - delivering (step 107) the foot dimensions to the data base (20, 22) comprising data on a plurality of footwear, for searching for footwear matching the foot dimensions;
   - receiving (step 108) data on the footwear matching the determined foot dimensions; and
   - visualizing (step 109) by means of a visualisation means (35) data on the user terminal (10, 12, 14, 16) concerning the matching footwear, including anatomically designed insoles or other inserts, which together with the other footwear improves the fit additionally.

2. Method according to claim 1, **characterized** in that:
   - the reception (step 108) of data on the footwear matching the determined foot dimensions is effected separately for the right foot and for the left foot.

3. Method according to claim 1 or 2, **characterized** by the steps of:
   - creating a list which is displayed (step 108) on the user terminal (10, 12, 14, 16) of matching footwear; and
   - selecting (step 109) at least one footwear from the list created for visualisation on the user terminal (10, 12, 14, 16).

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4. Method according to claim 1 or 2, further **characterized** in that:
   - the visualisation (step 109) is effected with the aid of a comparative matrix containing data on the user foot dimensions and corresponding dimensions of the suggested footwear, with the aid of said matrix, comparisons being possible with or without insoles.

5. Method according to one of claims 1-3, **characterized** in that:
   - during visualisation, a space is indicated between the footwear and the foot as an air surface, and an overlap between the footwear and the foot is indicated, as a pressure surface.

6. Method according to one of claims 1-4, **characterized** in that:
   - the foot dimensions are determined by means of an optical measuring device coupled to the computer system and adapted to generate the foot dimensions in computer-readable form.

7. Method according to one of claims 1-4, **characterized** in that:
   - the foot dimensions are determined manually, and the manually measured foot dimensions are entered into the computer system via one of the user terminals (10, 12, 14, 16).

8. Method according to one of the preceding claims, further **characterized** in that:
   - the user is given the possibility of acquiring (step 114) in the system a selected footwear;
   - a footwear selected by the user is identified;
   - an order for the identified footwear is generated; och
   - the order with the foot dimensions is delivered (step 116) to the user, who is identified by the data received in the above steps.

9. Method according to one of the preceding claims, further **characterized** in that:

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- the user is given the possibility of using user specific data previously stored in the system, i.e. the user's profile, in order to more rapidly find a perfect fitting footwear after having used the system at least once previously.

10. Computer system, comprising a database (120, 22), which is accessible from at least one user terminal (10, 12, 14, 16) and from at least one retailer terminal (30), said computer system being constructed to perform the method according to one of the preceding claims.

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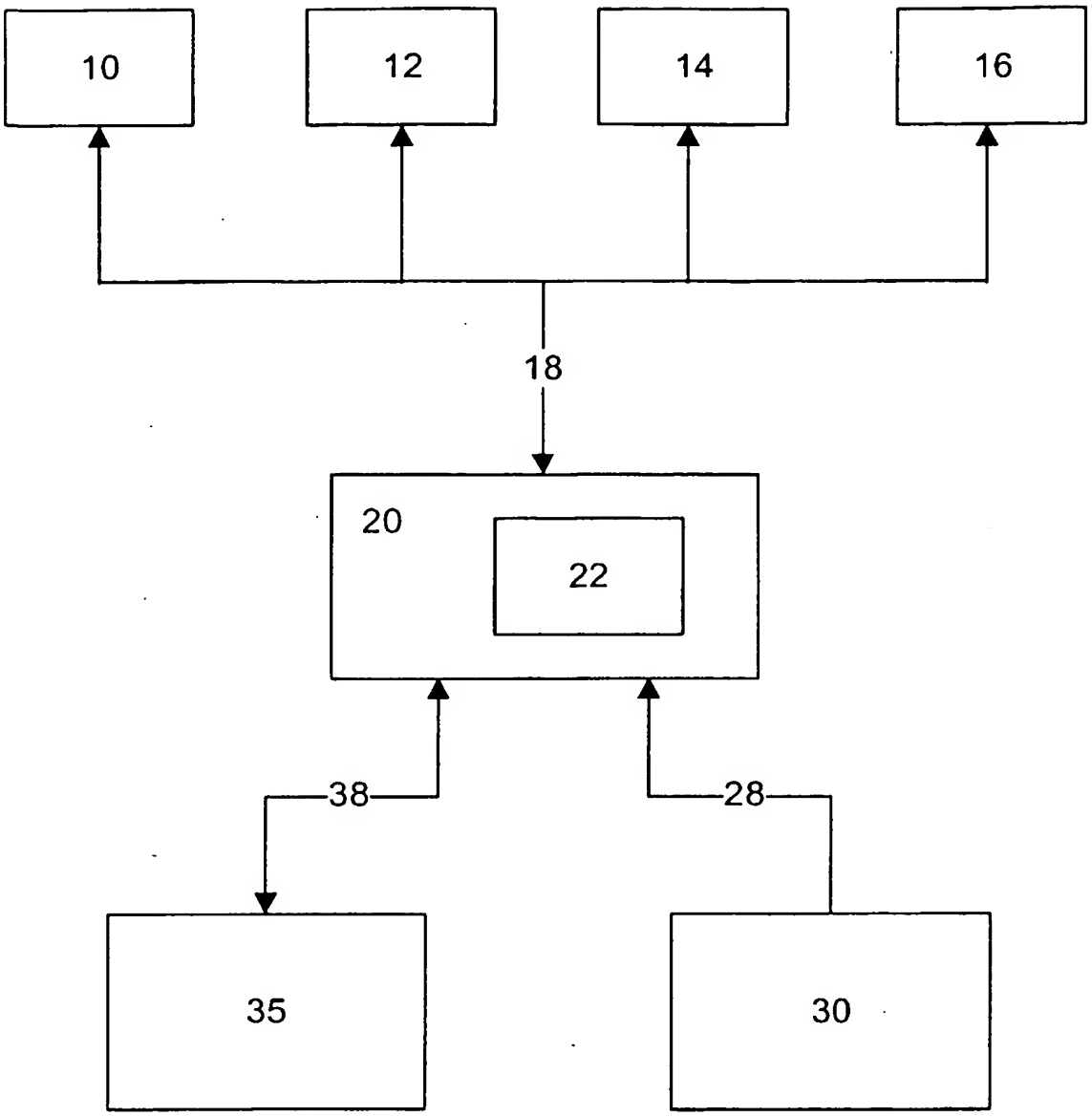


Fig. 1

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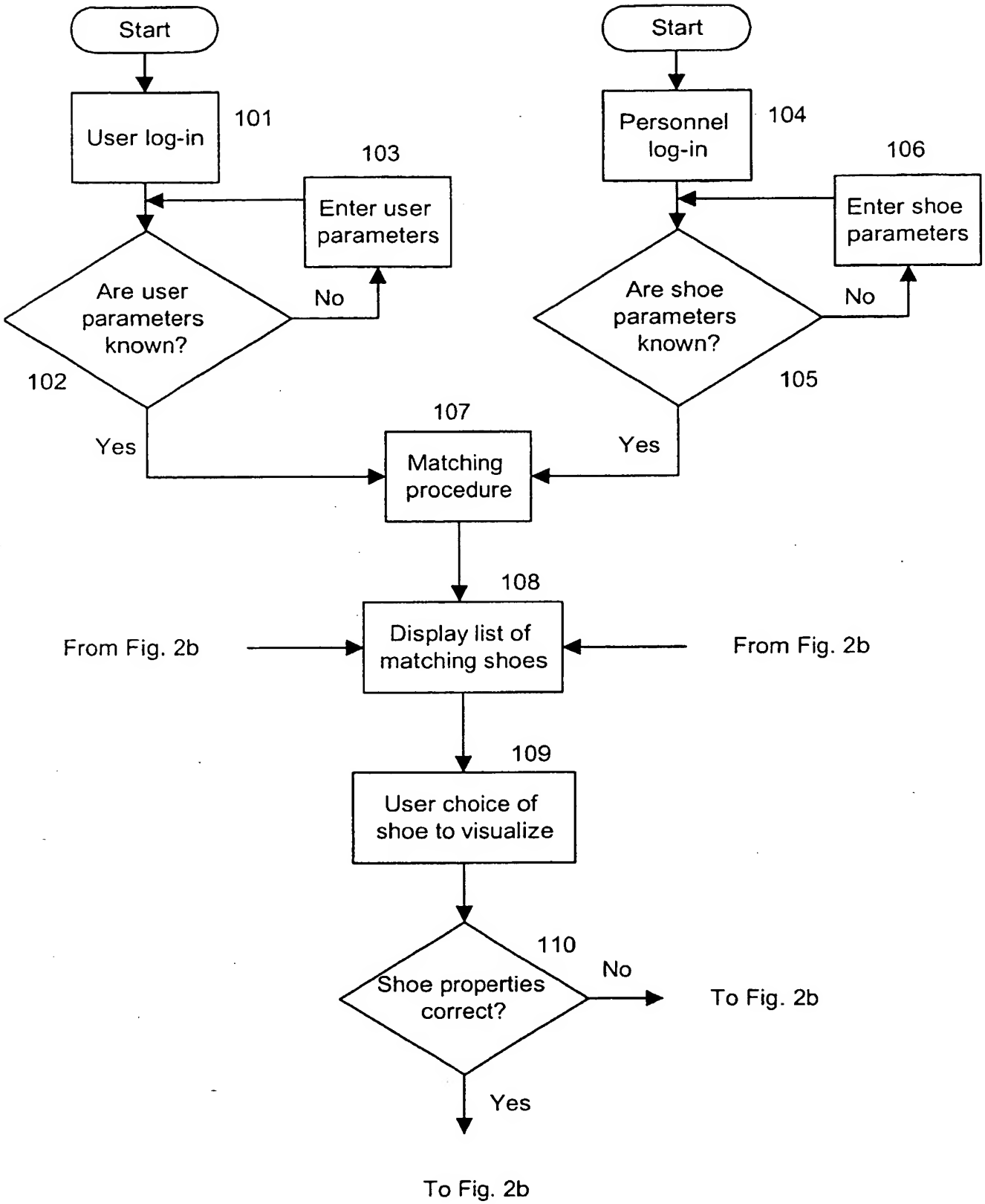


Fig. 2a

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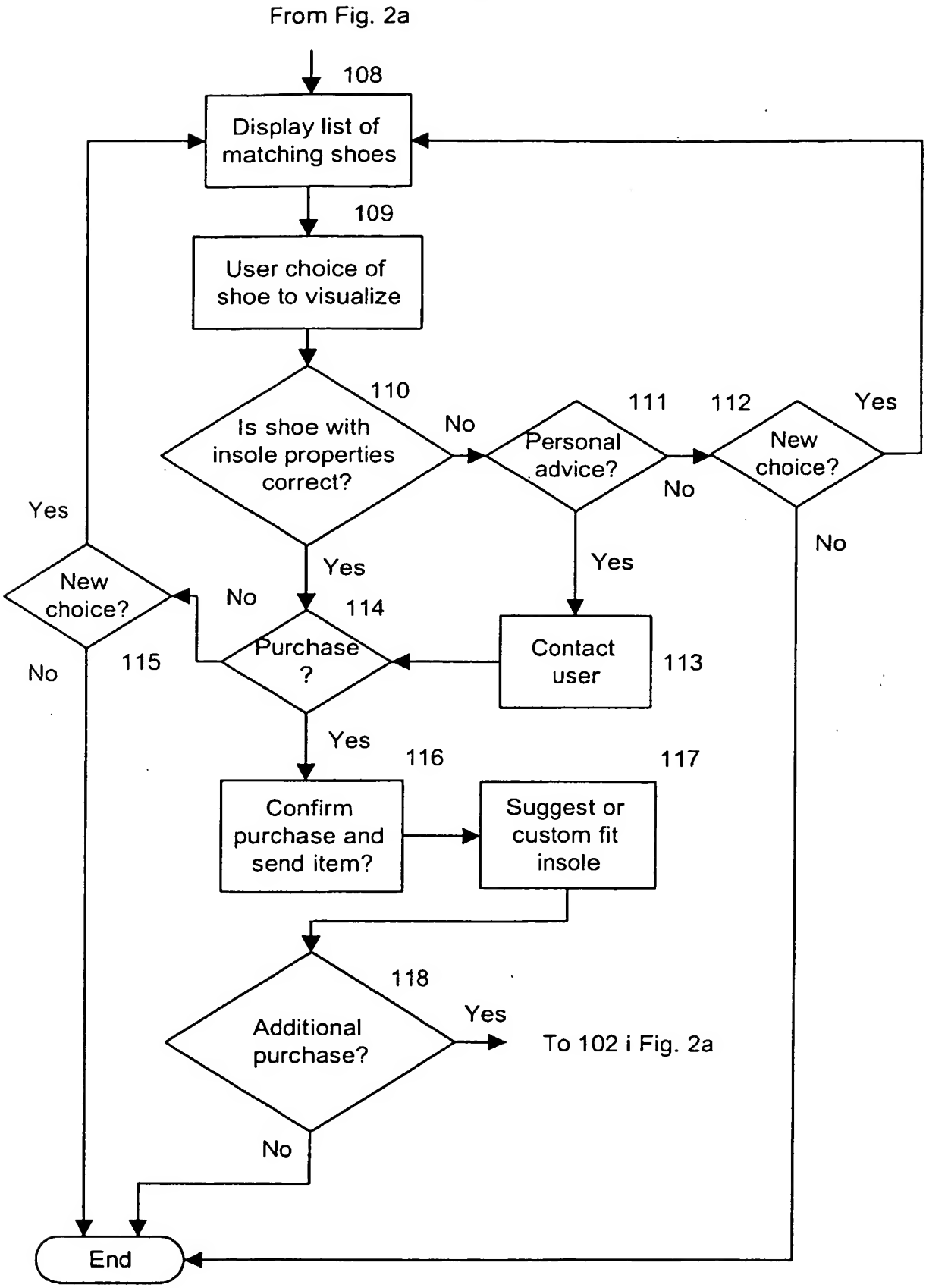


Fig. 2b

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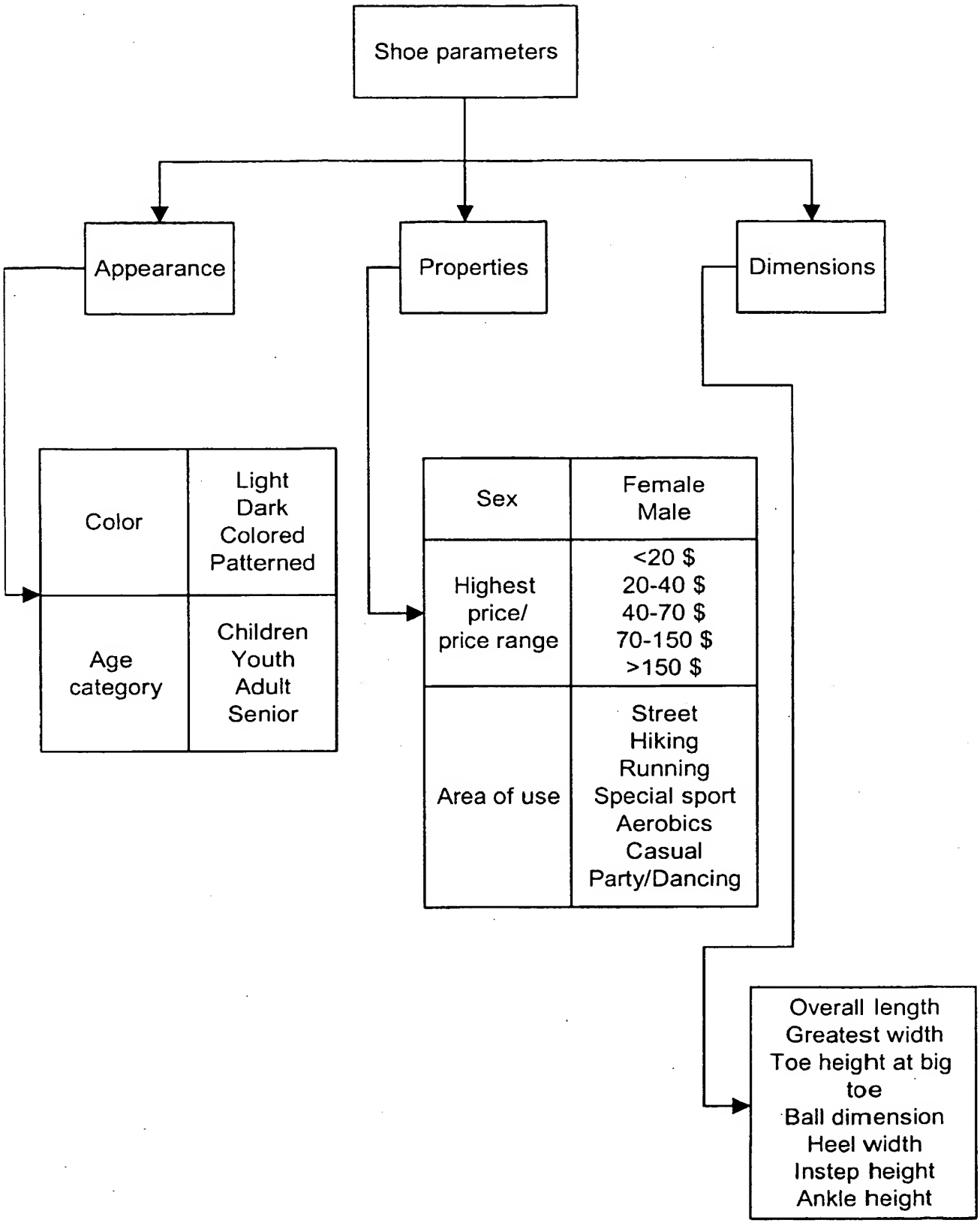


Fig. 3

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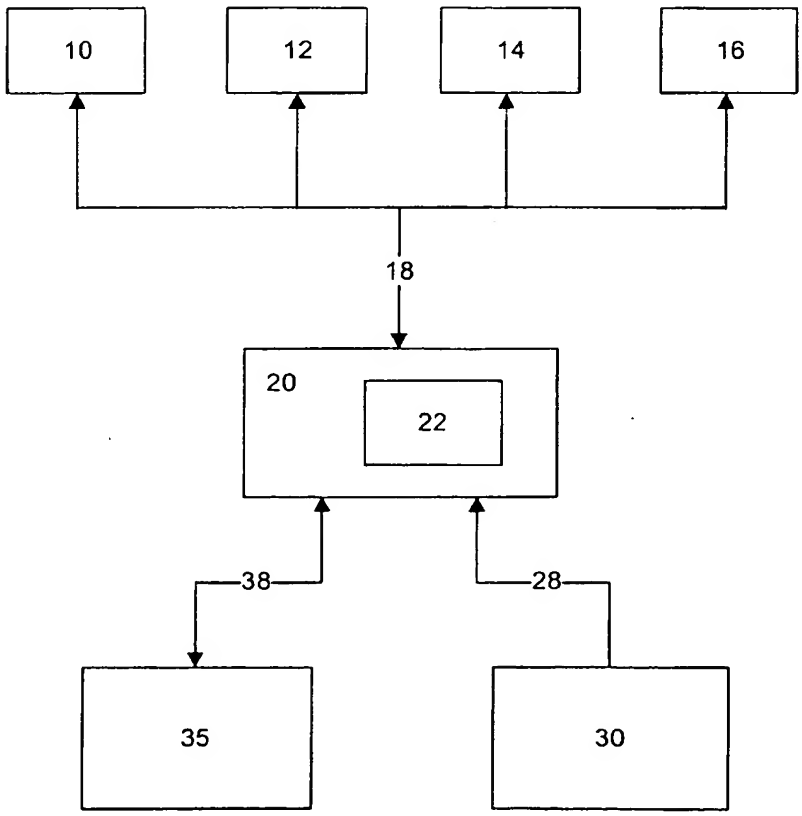
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

*[Continued on next page]*

(54) Title: METHOD AND SYSTEM FOR MATCHING SHOES AND INSOLES TO FEET




(57) Abstract: The present invention relates to a method of facilitating acquisition of perfectly fitting footwear including anatomically designed insoles, for a user's foot by means of a computer system. The system comprises a data base (20, 22) which is accessible from at least one user terminal (10, 12, 14, 16) and from at least one retailer terminal (30). Furthermore, the method is characterized by the steps of: determining (steps 102, 103), a set of dimensions of the user's foot by means of a measuring device; delivering (step 107) the foot dimensions to the database (20, 22) comprising data on a plurality of footwear for searching for footwear which matches the foot dimensions; receiving (step 108) data on the footwear matching the determined foot dimensions; and visualizing (step 109), by means of a visualisation means (35), data on the user terminal (10, 12, 14, 16) concerning the matching footwear, including anatomically shaped insoles or other inserts which, together with the rest of the footwear, improves the fit additionally. In this way, more people will have access to specially fitted shoes at reasonable price, which has appreciable effects on the general level of health.

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**Published:**

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6 November 2003

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International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F, A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | WO 0152140 A1 (SILVERMAN, JEFF), 19 July 2001 (19.07.01), page 4, line 14 - page 5, line 7; page 7, line 12 - line 34, abstract<br>-- | 1-10 |
| X | US 5128880 A (JAY P. WHITE), 7 July 1992 (07.07.92), column 15, line 64 - column 16, line 14, see the whole document, especially column 3, 9 and 10<br>-- | 1-10 |
| A | WO 0118698 A1 (POMARFIN OY), 15 March 2001 (15.03.01), page 5; page 6, abstract<br>-- | 1-10 |

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
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| 2 December 2002 | 17 -12- 2002 |
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | WO 0139051 A2 (MEYDEN, NICO, J.), 31 May 2001 (31.05.01), abstract<br><br>--<br>-------- | 1-10 |

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# INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/01744

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 0152140 A1 | 19/07/01 | AU 2444401 A | 24/07/01 |
| US 5128880 A | 07/07/92 | AT 112668 T | 15/10/94 |
| | | AU 646402 B | 24/02/94 |
| | | AU 6155090 A | 10/12/91 |
| | | CA 2082518 A | 12/11/91 |
| | | DE 69013364 D,T | 16/02/95 |
| | | EP 0527732 A,B | 24/02/93 |
| | | JP 2989664 B | 13/12/99 |
| | | US 5237520 A | 17/08/93 |
| | | WO 9117708 A | 28/11/91 |
| WO 0118698 A1 | 15/03/01 | AU 7003200 A | 10/04/01 |
| | | EP 1242937 A | 25/09/02 |
| | | FI 991904 A | 07/03/01 |
| | | US 2002120531 A | 29/08/02 |
| WO 0139051 A2 | 31/05/01 | AU 2668001 A | 04/06/01 |
| | | DE 19956574 A | 31/05/01 |

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